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When Social Forces Remove the Impact of Competition: Social Exchange in Experimental Labor Markets

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Abstract

Do competitive markets remove the impact of social norms and customs on market outcomes? Or are these social forces capable of exerting a persistent influence? Many economists seem to believe that social norms and customs have, if at all, only temporary effects in competitive markets. So far this belief has been confirmed by the evidence of many competitive market experiments. In this paper we report the results of a series of competitive market and bilateral bargaining experiments. They indicate that social norms may not only persist in a competitive environment but that they may completely remove the impact of competition on the market outcome.

Zusammenfassung

Bewirken kompetitive Märkte, daß soziale Normen und Gewohnheiten im Markt verschwinden? Oder können diese sozialen Einflüsse einen dauerhaften Einfluß auf das Marktgeschehen ausüben? Viele Ökonomen glauben, daß soziale Normen und Gewohnheiten höchstens einen nicht dauerhaften Einfluß ausüben. Viele kompetitive Marktexperimente haben bis jetzt Evidenz für diesen Glauben geliefert. In dieser Arbeit berichten wir über Resultate in einer Reihe von kompetitiven Markt- und bilateralen Verhandlungsexperimenten. Die Resultate zeigen, daß soziale Normen in einem kompetitiven Rahmen nicht nur erhalten bleiben, sondern daß sie den Einfluß kompetitiven Verhaltens auf das Marktergebnis ausschalten.

Keywords
Competition, Social Exchange, Trust, Reciprocity, Social Norms

JEL Classification
C91, C92, J30, J31, J41

Comments
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I. Introduction

Are "noneconomic" forces like customs, social norms or standards of fairness capable of exerting a lasting impact on competitive markets? Or is their role limited to transitory effects? Although economists have for a long time recognized that social forces may affect market prices and , in particular, market wages they have been hesitant to assign these forces a prominent role. In his chapter on "Earnings of Labour" of the "Principles of Economics " Alfred Marshall (1890, p. 465), for example, writes:

> "... the direct effects of custom in causing a thing to be sold for a price sometimes a little higher and sometimes a little lower than it would otherwise fetch, are not really of very great importance, because any such divergence does not , as a rule, tend to perpetuate and increase itself; but on the contrary, if it becomes considerable, it tends itself to call into action forces that counteract it. Sometimes these forces break down the custom altogether; but more often they evade it by gradual and imperceptible changes...."

In his "Theory of Wages" Hicks (1932, p. 80) goes even further by claiming that considerations of fairness and justice are in general **not** opposed to the working of supply and demand. Such considerations even facilitate the effectiveness of economic forces:

> But although fairness and justice appear "to be the motive for a very large proportion of wage-changes, it is not their real reason. These rules of fairness and justice are simply rough-and-ready guides whereby the working of supply and demand is anticipated. "

More than 20 years after the publication of the "Theory of Wages" Hicks accorded "noneconomic" forces at least a temporary role in the process of wage determination:

> "There has ..... always been room for wages to be influenced by noneconomic forces - whether by custom (which, economically speaking, means supply and demand of the day before yesterday) or by any other principle which affects what the parties to the wage bargain think to be just or right. Economic forces do affect wages, but only when they are strong enough to overcome these social forces."(Hicks, 1955, p. 390).

In the above quotation it remains an open question whether and under which circumstances economic forces, that is, the forces of supply and demand, dominate social forces. Yet, in his

subsequent analysis Hicks made it clear that under competitive conditions the forces of supply and demand will ultimately prevail over social forces.

More recently the question to what extent standards of fairness affect economic behavior again has caused a debate. The study of Kahneman, Knetsch and Thaler (KKT, 1986) shows, for example, that economic exchanges are quite frequently associated with strong feelings about the fairness or unfairness of the transaction. Their main finding can be summarized by the principle of dual entitlement. This principle stipulates that transactors are entitled to the terms of a reference transaction. If an exchange violates the terms of the reference transaction it is, in general, judged to be unfair. KKT also argue that such **judgements** of unfairness affect people's **behavior**, that is, they induce a willingness to punish firms which try to impose unfair terms of exchange. This willingness to punish unfair behavior may give rise to excess demand in customer markets (or excess supply in labor markets) because firms are reluctant to raise prices (or lower wages).

KKT, however, carefully restrict the validity of their excess demand proposition to the short run. The impact of fairness standards is expected to prevail only in the short run because the reference transaction will shift over time. "Terms of exchange that are initially seen as unfair may in time acquire the status of a reference transaction" (p. 731). And: "For new transactions, **prevailing competitive** (our emphasis) prices or wages provide the natural reference" (p. 730). Thus, in KKT fairness standards throw sand into the machinery of competition but ultimately the law of supply and demand gives rise to competitive prices. This view is reminiscient of Hick's remark that custom is nothing else but supply and demand (i.e. equilibrium wages) of the day before yesterday.

The proposition that fairness standards cause nonclearing markets **in the short run** has been confirmed in recent experiments by Franciosi, Kujal, Michelitsch, Smith and Deng (1994). Franciosi et al. conducted a series of posted offer markets over two ten-period sequences. Under the parameter constellation of the first ten-period sequence markets neatly converge to the competitive equilibrium. At the beginning of the second ten-period sequence (in period 11) a parameter change is implemented such that at the new competitive equilibrium the price and the sellers' share of the total surplus is higher. In the absence of information about sellers' surplus share the market again converges quickly to the new competitive equilibrium. If, instead, market participants are informed about the rising profit share, price adjustment to the new competitive equilibrium is significantly slower. However, towards the end of the second ten-period sequence prices also converge to the competitive equilibrium.

Another piece of evidence for the limited role of social forces in competitive markets can be found in Roth, Prasnikar, Okuno-Fujiwara, Zamir (1991). The authors compare the outcomes of

ultimatum game experiments and competitive market experiments in several countries (Israel, Japan, Slowenia, USA). There are significant differences in the bargaining outcomes across countries which are attributed to cultural differences. However, these cultural differences are not capable of exerting a lasting effect in the competitive market. By period ten there is a concentration of offers around equilibrium prices in all four countries.

Our contribution in this paper is closely related to the work of Akerlof (1982) and Akerlof and Yellen (1990)[1]. These authors set up models in which social norms of reciprocal behavior have a lasting impact on labor market outcomes. Since these models are not fully based on self-interested behavior many economists seem to be sceptical with respect to their relevance. In view of the above cited evidence from competitive experimental markets such scepticism seems to be justified. Despite this evidence, however, we question the view that social norms will at most be capable of exerting a transitory effect on competitive labor markets. It is our objective to show that there are conditions under which the norm of reciprocity has a permanent effect on the outcome of competitive experimental labor markets. Moreover, to our surprise we can even show that the forces of supply and demand may have only a short run impact on wages while ultimately they are fully dominated by the reciprocity norm.

The fact that competitive market experiments have so far provided a lot of evidence in favor of competitive theory (see e.g. Smith 1982) renders such experiments particularly suitable for an investigation of the role of social forces. In case that social forces exert a permanent nonnegligible effect on competitive experimental markets, we can regard this as a strong indication for the importance of these forces. This was one reason why we conducted such experiments. Another reason is related to the difficulty of separating the effects of competition and social forces on the market outcome. On the basis of the usually available field data it seems extremely difficult to achieve such a separation. If social norms, customs and standards of fairness play a role in reality, their effects are embodied in field data. Unless we know the competitive equilibrium which would be obtained in the absence of social forces we are not able to determine whether and to what extent social forces play a role[2]. In an experimental market, however, the experimenter is capable of controlling supply and demand and, hence, the competitive equilibrium. Due to this increased control experimental methods seem to be of particular value in the study of our questions.

We have conducted several bilateral exchange and competitive market experiments. By design, in the bilateral exchange experiments competition could play no role. The reciprocity norm could, however, be operative. In case of its effectiveness it was likely to contribute to relatively high wages. Then we introduced a competitive experimental market with an excess supply of labor. In

[1] It is also closely related to Solow's (1990) view of the labor market.

[2] If it is unclear whether markets are competitive, the problem is even more complicated.

this market the reciprocity norm could, in principle, be operative in the same way as in the bilateral exchange situation. Yet, due to the excess supply of labor and the competitive nature of the market, competitive economic forces pulled in the opposite direction. There was, thus, a conflict between social forces and competitive forces. While the norm of reciprocity exerted an upwards pressure on wages competition for jobs among workers allowed firms to reduce wages. By comparing wages in the bilateral exchange experiment with wages in the competitive market experiment we were able to determine the relative strengths of these two forces. Initially we expected that some kind of balance between social forces and competitive economic forces would emerge. Yet, to our surprise it turned out that ultimately competitive forces became ineffective and were completely dominated by the impact of the reciprocity norm on wage formation.

Our paper is organized as follows. Section II outlines the potential role of the reciprocity norm under conditions of incomplete contracts; Section III describes the experimental design in some detail. Section IV develops predictions for the case that the norm of reciprocity is operative and presents the experimental results which are discussed and interpreted in section V. Concluding remarks on the relevance of social exchange processes are made in section VI.

II. Social exchange and behaviorally relevant reference agents

The starting point for our reasoning is the observation that employment contracts are incomplete. This is by now a widely recognized fact[3] which has triggered an impressive amount of insights in the areas of principal-agent theory, unemployment theory, etc[4]. Economists have, in general, concentrated their attention on the **economic** incentives which arise under conditions of incomplete labor contracts. However, as has been pointed out by Blau (1964) some decades ago, incomplete labor contracts frequently give rise to **unspecified** obligations and these, in turn, transform the employment relation from a purely economic exchange relation into a social exchange relation. According to Blau, the major difference between purely economic exchanges

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[3] In the relatively new textbook of P. Milgrom and J. Roberts (1992) we find, for example, the following paragraph (p. 329): "The employment contract is typically quite imprecise. The employees agree that - within limits that are rarely completely described and only partly understood - they will use their minds and muscles to undertake the tasks that the employer directs them to do, perhaps using the methods that the employer specifies. The employer agrees to pay the employees. The range of actions that might be requested or required is unclear. Future compensation and even the criteria used to determine future pay and promotions are unspecified. The mechanisms to be used in case of dispute are not stated, nor are the penalties for most possible violations of the contract."

[4] For surveys see, for example, Hart and Holmström (1986) and Weiss (1990).

and social exchanges arises from the fact that the latter involve unspecified obligations while the former do not.

"Social Exchange involves the principle that one person does another a favor, and while there is a general expectation of some future return, its exact nature is definitely *not* stipulated in advance" (Blau 1964, p. 93, emphasis by Blau). Moreover, the incomplete specification of future returns is accompanied by the absence of a formal enforcement mechanism. In case that the person who received a favor fails to reciprocate there are no **direct** means of forcing him to pay his "debt". Due to this enforceability problem social exchanges in general require some trust.

But why do people, who cannot be forced to reciprocate favors, honour trust? In this context Blau discusses a number of indirect enforcement mechanisms like (i) withdrawal of support in the future and (ii) the loss of reputation in the community. He also refers (iii) to the feelings of personal obligations which give rise to "the fundamental and ubiquitous norm of reciprocity" (p. 92). At this point it seems useful to stress some important differences among these indirect enforcement mechanisms. In a repeated relationship it is often in a person's pecuniary interest to reciprocate favors because of the expected withdrawal of future benefits[5]. A loss of reputation in the community is frequently connected with nonpecuniary utility losses because people, in general, value social approval positively. It may, however, also be associated with pecuniary losses. In contrast, the feelings of personal obligations are not directly related to a person's self interest. Nonetheless, to the extent to which they are present they are likely to induce people to reciprocate favors and, thus, to establish a norm of reciprocity[6].

We believe that the long run nature of the employment contract and the intensity of social interaction among workers and between workers and their superiors render the first two indirect enforcement mechanisms important in reality. In this paper we are, however, for several reasons mainly interested in the third mechanism: First, we think that it is also potentially important in reality. Second, if we are able to show that the honouring of trust (i.e. the reciprocation of favors) even occurs in the absence of self-interest-based enforcement mechanisms reciprocation is more likely to occur if these mechanisms are also operative. As a consequence, if in the absence of self-interest based enforcement mechanisms reciprocal behavior is capable of exerting a stable and persistent influence on competitive experimental markets it seems even more likely that this

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[5] Modern game theory shows that in infinitely repeated games and in finitely repeated games with opportunities for reputation formation selfish people may well honor trust.

[6] We are, thus, assuming that the norm of reciprocity cannot be completely reduced to self interested behavior. This view is also expressed in Elster (1989): "Social norms spring from psychological propensities and dispositions." (p. 114) And: "I do not believe that self-interest provides the full explanation for adherence to norms" (p. 115).

impact can be observed when these mechanisms are not ruled out by design. Or put differently: Our results are stronger if the first two enforcement mechanisms cannot become operative.

Social exchanges tend to arise in situations of unspecified obligations. Yet, if obligations are unspecified or only vaguely specified, the norm of reciprocity cannot in itself tell how much one should reciprocate. Moreover, the extent to which a person's behavior is determined by the norm of reciprocity depends on the intensity of feelings of personal obligations. It is here were the concept of a reference agent or a reference group becomes important. The reference agent is decisive for what "the parties to the wage bargain think to be just or right". It is hypothesized that the feelings of personal obligations are to a large extent determined by a process of social comparison with relevant reference agents. The intensity of such feelings will, in turn, be a determinant of the size of the favors reciprocated.

Two types of agents are relevant reference agents for our presumed reciprocator: (i) The agent who made the initial "gift" and (i i) other agents who received similar "gifts". In general, the intensity of feelings of obligations is expected to be positively related to the generosity of the gift (i.e. the larger its cost relative to the income of the "giver") and to the extent to which other agents reciprocate. As a consequence the size of the favor which is reciprocated will also be positively related to the generosity of the gift and the extent to which other agents reciprocate.

In situations with unspecified obligations the norm of reciprocity ensures that favors are in general reciprocated. Yet, in such situations people do not only exchange favors. Sometimes they also engage in disutility inflicting behavior. If somebody fails to meet the obligation to make an appropriate "gift", for example, there will not only be no feelings of obligation. Instead, there will be feelings of frustration and anger which are likely to generate a willingness to punish. Feelings of obligation and feelings of anger are just two sides of the same coin. While the first give rise to positive reciprocation, that is, the exchange of favors, the second induce negative reciprocation, that is, the willingness to hurt back.

If employment relations not only involve pure economic exchanges but instead are more appropriately characterized as social exchange relationships, positive and negative reciprocation should be observed or should at least have observable consequences. In the context of employment relations the behaviorally relevant reference agents for a worker are likely to be the employer and the worker's colleagues. Therefore, if effort is noncontractible and, hence, determined by the hypothesized regularities of social exchange processes, we should observe the following: The effort of a particular worker positively depends on his wage and on other workers' effort levels. As a consequence it may be profitable for employers to induce reciprocal effort

responses by paying wages above market clearing levels (Akerlof 1982, Akerlof and Yellen 1990).

III. Experimental design

The purpose of our experimental design was twofold. First of all, we wanted to know whether the postulated regularities of social exchange theory can be observed in our experiments. Our second objective was the determination of the relative impact of the reciprocity norm vis à vis the traditional forces of supply and demand in a competitive experimental labor market. In particular, we wanted to find out to what extent competitive forces would weaken the impact of the reciprocity norm on market wages.

Specifically the following design was implemented (see also Table 2): In a **first treatment condition** workers and firms conducted purely bilateral exchanges. We call this the Bilateral Gift Exchange (BGE) treatment. In a **second treatment** the same structure of the employment relation as in the BGE was implemented but it was embedded in a competitive experimental labor market. We call the experimental sessions under this treatment "Gift Exchange Markets" (GEMs). Finally, in our **third treatment**, we introduced a different type of competitive experimental market which we called, for reasons which will become clear later, "Complete Contracts Market" (CCM).

III.1. Bilateral Gift Exchange (BGE)

In the BGEs there were, in general, ten workers and ten firms which traded for ten periods. In each period firms and workers faced different trading partners, that is, a given firm (worker) was never rematched with the same opponent. Since each subject on the firms' side faced each subject on the workers' side exactly once and since trade took place anonymously no reputation could be developed. Subjects knew that they faced a different opponent in each period. At the beginning of a period each firm could make a wage offer w to that worker with whom it had been matched. The worker could accept or reject this offer. If he rejected w both the firm and its worker earned nothing in this period. If the worker accepted the wage offer he had to decide how much effort to provide. The firm's payoff function in terms of experimental money[7] was given by

$$\pi = (v - w)\, e \tag{1}$$

[7] The experimental currency was termed "Guilders" in the experiment.

where v represents an exogenously given redemption value while e denotes the worker's effort choice. The worker's payoff function in terms of experimental money was defined as

(2) $$U = w - c(e) - c_0$$

where c(e) denotes strictly increasing effort costs while c_0 represents the (opportunity) costs of accepting an offer. The feasible effort levels and the associated costs were given as in Table 1.

INSERT TABLE 1 HERE

Thus, in the BGE, labor contracts were incomplete because they did not specify effort levels. There was an exogenously specified minimum effort level which was enforceable by the firms (e=0.1). All higher effort levels were not enforceable, neither by reputation effects nor by any other means. Therefore, the only way for firms to receive high effort levels was to induce "feelings of obligations" by offering high wages.

v and c_0 were fixed at $v = 120$ and $c_0 = 20$, respectively. To exclude the possibility of losses wage offers above $v = 120$ and below $c_0 = 20$ were not allowed. The choice of payoff function (1) was also guided by the attempt to avoid losses. It is by now well known that behavior may be affected by loss aversion[8]. Since we wanted to rule out that the impact of social forces is "polluted" by loss aversion phenomena we implemented payoff function (1) instead of the more familiar function $\pi = v\,e - w$. As will be shown below, under the usual assumption of rational money maximizing agents, our choice of the payoff function does neither qualitatively nor quantitatively affect the behavior of experimental subjects.

III.2. Gift Exchange Market (GEM)

In the GEMs the payoff functions of firms and workers were also given by (1) and (2). Moreover, the parameters v, c_0 and c (e) were the same as in the BGE. The GEM was also conducted over ten periods and each period consisted of two stages. First, there was the wage determination stage which was followed by the effort determination stage. The major difference between the BGE and the GEM concerns the wage determination and the matching process. While in the BGE the matching of firms and workers was exogenously given, the constitution of firm-worker pairs in the GEM was embedded in a competitive bidding process.

[8] For a summary see Tversky and Kahneman (1992)

In the GEM wages were determined by a one-sided oral bid auction. During the first stage of a period, which was limited to four minutes, firms publicly announced their wage offers. These offers were written on a blackboard and could be accepted by each worker. Workers could not make counteroffers. Firms were allowed to revise their wage offers during the wage determination stage[9]. A worker could accept at most one offer and a firm could employ at most one worker. The number of workers L always exceeded the number of firms N, that is, there was always an excess supply of labor.

The worker's acceptance of an offer implied that he was employed by the firm which had made the offer. When all firms had employed a worker or when the time limit of four minutes was reached, the first stage of a GEM-period was finished. At the second stage, those workers who had accepted a wage offer had to choose their effort levels.

III.3. Complete Contracts Market

CCMS also lasted for ten periods and wages were determined in a one-sided oral auction. As in the GEM a worker could accept at most one offer per period and a firm could employ at most one worker. Likewise there was always an exogenous excess supply of workers. In the GEMs and the CCMs the number of firms N varied between 6 and 8 while the number of workers L varied between 9 and 12. In all CCMs (GEMs) the number of workers exceeded the number of firms by exactly 50% (by at least 50%)[10].

Contrary to the BGE and the GEM there was no effort stage in the CCM. e was set exogenously equal to one and no effort costs were subtracted from a worker's wage. In the CCM the payoffs in terms of experimental money from a labor contract were, therefore, given by

(1') $\pi = v - w$

(2') $U = w - c_0$.

where $v = 120$ and $c_0 = 20$.

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[9] With regard to the revision of offers we implemented the improvement rule. This rule, which is frequently implemented in auctions, stipulates that any new offer has to be better (higher) than the best prevailing offer that has not yet been accepted.

[10] In two GEMs there were exactly 50% more workers while in two other GEM-experiments the relationship was 7:11. These differences in L and N across treatments occurred because sometimes not all subjects showed up who had applied for participation.

III.4. Information Conditions

In all treatment conditions the parameters v, c_O, c(e), the number of workers L, the number of firms N, the fact that there were ten periods and the exchange rate between experimental money and real money were common knowledge. Thus all subjects knew the excess supply conditions in the GEMs and CCMs. At the beginning of each session a random mechanism determined whether a subject was a firm or a worker. Before the start of a ten-period session a trial period was conducted in which no money was at stake. Before this trial period subjects had to solve several exercises in which they had to compute their own money payoffs as well as the money payoffs of their trading partner from hypothetical trades.

In the BGE the wage offer w and the effort choice e of each firm-worker pair was private information; it was only known to the firm and the worker who were involved in a given trade. In the GEM and the CCM w was public information. Effort levels in the GEM were, however, also only known to the firm-worker pair who participated in a trade. Since in the BGE and in the GEM a worker did not know the effort levels of other workers, these effort levels could not serve as reference actions. The reason for this was that we wanted to rule out group pressure effects. In addition, our objective was to isolate the extent of reciprocation that is solely due to firms' wage offers. These information conditions ensured that in all three treatment conditions subjects could compute their own payoffs and the payoffs of their trading partners.

In all treatments the identity of a subject was not known to the trading partner. Neither firms nor workers knew with whom they traded. To ensure this anonymity condition firms and workers were located in different rooms and the communication between these rooms took place by means of a telephone.

INSERT TABLE 2 HERE

IV. Experimental results

In total we have conducted four BGEs, four GEMs and four CCMs. All experiments took place at military barracks in Linz and Vienna, Austria. Our subjects were soldiers with widely differing skill and educational levels. Some of them had university degrees, others were unskilled workers. Most participants were in their early twenties. The weekly income of almost all participants was 300 Austrian Schillings (ATS). On average a ten period session lasted 2 hours and subjects earned 165 ATS which is rather high in comparison with their weekly incomes. As a consequence the participants were highly motivated and took their tasks very seriously.

In the GEMs the number of potential trades was 260 which coincided with the actual number of trades. In the BGE there were 400 potential trades but workers rejected low wages in 26 cases while employers made no offers in 9 cases. In the CCMs there were 320 potential trades but in 13 cases workers refused to accept the offered wages and, hence, no trade took place.

IV.1 Do workers reciprocate favors?

If the reciprocity norm as described in section II is behaviorally relevant reciprocation should be observed in the BGEs and in the GEMs. In the context of these two treatment conditions the norm implies that higher wages should be associated with higher effort levels. Moreover, if the principle is not just of a temporary nature we should observe a positive correlation between wage and effort in all ten periods. We formally state this as

H 1: In the BGEs and the GEMs effort is positively related to wages. There is no tendency for this positive correlation to decrease over time.

It is worthwhile to contrast H1 with the prediction in case of rational money maximizing workers. Since c(e) is strictly increasing in e and since reputation effects have been ruled out by design, a money maximizing worker will always choose $e = 0.1$. We should thus observe no systematic relation between wages and effort levels. To test H1 we ran several OLS - and two-sided censored Tobit regressions of effort on wages. The application of censored regressions is necessary because effort is exogenously bounded from below ($e \geq 0.1$) and from above ($e \leq 1$). It turned out, however, that neither the sign, nor the size , nor the significance levels of the OLS-estimates were much different from the Tobit estimates. In the following we present the numerical results and the graphical representations of the Tobit estimations. In Figure 1 and Table 3 we show the results of the simple Tobit-regression

$$(3) \qquad e = \alpha + \beta w + \varepsilon \qquad \text{if } 0.1 < RHS < 1$$
$$\text{and } e = 0.1 \ (e = 1) \text{ if } RHS \leq 0.1 \ (RHS \geq 1)$$

where ε denotes the error term while RHS (Right Hand Side) is defined as $RHS \equiv \alpha + \beta w + \varepsilon$. Figure 1 provides a first indication that effort is positively related to wages. In the BGEs als well as in the GEMs the regression line is positively sloped ($\beta > 0$). Moreover, as the prob-values for β, $p(\beta)$, show β is always highly significant; the α-coefficient is, however only significant in the GEMs (at the 5 percent level).

INSERT FIGURE 1 HERE

INSERT TABLE 3 HERE

Table 3 and Figure 1 allow us to conclude that <u>on average</u> workers reciprocate according to the favors they received from firms[11]. They do not reveal, however, whether there were significant behavioral differences among workers. To analyse this question we performed regression

(4) $$e = \sum_{i=1}^{n} \gamma_i d_i + \beta w + \varepsilon \quad \text{if } 0.1 < \text{RHS} < 1$$
$$\text{and } e = 0.1 \ (e = 1) \text{ if RHS} \leq 0.1 \ (\text{RHS} \geq 1)$$

where RHS $\equiv \sum_{i=1}^{n} \gamma_i d_i + \beta w + \varepsilon$ and $d_i = 1$ in case that worker i was involved in the trade. As Table 4 reveals the β-coefficient is again positive and highly significant in both treatments. In column p(W) of Table 4 we have computed the Wald-statistic for the null hypothesis that all individual intercepts γ_i are equal to the intercept α in equation (3). The prob-values for the Wald-statistic indicate that this hypothesis can be rejected for both the BGEs and the GEMs. Thus, there are significant differences among workers, that is, some reciprocate at higher levels of e.

INSERT TABLE 4 HERE

In the BGE it is common knowledge that each subject faces a new partner in each period. Therefore, there can be no strategic spillovers across periods. Yet, it may still be possible that, initially, workers reciprocate and firms expect workers to reciprocate but that over time the extent of reciprocation declines. In fact, from an economist's viewpoint reciprocal behavior grossly violates the assumption that subjects are rational money maximizers. Perhaps subjects in the BGEs needed just some time to learn what is best for them. A similar argument can be made for the GEMs. To check the impact of time we included time dummies into our regressions:

(5) $$e = \sum_{t=1}^{10} \delta_t d_t + \beta w + \varepsilon \quad \text{if } 0.1 < \text{RHS} < 1$$
$$\text{and } e = 0.1 \ (e = 1) \text{ if RHS} \leq 0.1 \ (\text{RHS} \geq 1)$$

where RHS $\equiv \sum_{t=1}^{10} \delta_t d_t + \beta w + \varepsilon$ and $d_t = 1$ ($d_t = 0$) in case of period t observations (otherwise). Table 5, which reports the results of regression (5), reveals that β is again positive and highly significant. In addition the hypothesis that all δ_t are equal to the α-coefficient of regression (3), for which we computed the Wald-statistic, cannot be rejected at all conventional significance levels. Thus, the extent of reciprocation does not seem to change over time. This result is reinforced if,

[11] It is perhaps important to stress that β is not only positive in the regressions with all BGE-data and all GEM-data but also if we run separate regressions for each ten period session.

instead of period dummies for the intercept, we allow for time-dependent slopes. This leads us to regression

(6) $$e = \alpha + \sum_{t=1}^{10} \beta_t d_t w + \varepsilon \qquad \text{if } 0.1 < RHS < 1$$
$$\text{and } e = 0.1 \ (e = 1) \text{ if } RHS \leq 0.1 \ (RHS \geq 1)$$

where $RHS = \alpha + \sum_{t=1}^{10} \beta_t d_t w + \varepsilon$ and $d_t = 1$ ($d_t = 0$) in case of period t observations (otherwise). As Table 6 reveals there is not any single period in the BGEs and the GEMs in which β_t is not significantly positive. Moreover, neither the size of the coefficients nor their prob-values vary systematically over time. In particular, β_t does not decline and the prob-values for **all** 20 β_t-coefficients are smaller than 0.0001. For both treatments we cannot reject the hypothesis that all β_t-coefficients are equal to the β-coefficients of Table 3 (see p(W) in Table 6). Thus, the results of regression (5) and (6) provide a strong indication that there is no decline in reciprocation over time. Reciprocal responses seem to be a stable phenomenon, that is, H1 is supported by the data.

INSERT TABLE 5 HERE
INSERT TABLE 6 HERE

Since we are interested in the question to what extent competition will outweigh the impact of reciprocity on wages we should know whether reciprocal behavior plays a bigger or a smaller role in markets relative to the BGEs. Figure 1 already indicates that in the GEMs reciprocation seems to be stronger because a given wage increase induces a larger effort increase in the GEMs. This is a surprising result because in the GEM the relevant reference agent is less clearly defined than in the BGE. In the GEM many firms make offers to a group of workers while in the BGE a particular firm makes an offer to a particular worker. Thus, in the BGE the relevant reference agent is clearly defined while in the GEM it seems to be more diffuse. As a consequence, one might expect that in the BGE a worker feels more obliged to reciprocate than in the GEM? After all, the wage offer he happened to catch in a competitive process was not directly addressed to him. To test more rigorously for behavioral differences between the BGE and the GEM we conducted the following Tobit-regression with BGE-dummies:

(7) $$e = \alpha + \alpha_B d_B + \beta w + \beta_B d_B w + \varepsilon \qquad \text{if } 0.1 < RHS < 1$$
$$\text{and } e = 0.1 \ (e = 1) \text{ if } RHS \leq 0.1 \ (RHS \geq 1)$$

where $RHS \equiv \alpha + \alpha_B d_B + \beta w + \beta_B d_B w + \varepsilon$ and $d_B = 1$ ($d_B = 0$) in case of a BGE observation (GEM observation). In the above equation the dummy coefficients α_B and β_B measure whether the intercept and the slope in the BGEs differ from the common intercept α and β. Estimating (7) gives us the following coefficients (prob-values are shown below the coefficients):

$\alpha = -0.128$	$\beta = 0.0088$	$\alpha_B = 0.151$	$\beta_B = -0.0033$
$p(\alpha) = 0.065$	$p(\beta) = 0.000$	$p(\alpha_B) = 0.06$	$p(\beta_B) = 0.012$

In the BGE the intercept is larger ($\alpha_B>0$) while the slope is smaller ($\beta_B<0$). The slope difference (β_B) is highly significant while α_B is only significant at the 6 percent level. Thus, there is some evidence that the extent of reciprocation is stronger in the GEM than in the BGE. This gives firms in the GEM an additional incentive to pay non-competitive wages because the rise in e and hence in π which results from a given wage increase is higher in the GEM. On the other hand, however, there is a large excess supply of workers in the GEM which should have a wage depressing effect compared to the BGE.

IV.2 The impact of competition on social exchanges

The results of the previous subsection indicate that a norm of reciprocity is operative in bilateral social exchanges between anonymous agents. Therefore, due to workers' reciprocal responses it may be profitable for firms in the BGE to be generous, that is, to refrain from pushing wages towards the lowest possible level. In addition, firms may pay generous wages to prevent negative reciprocation, that is, the rejection of low wage offers[12]. This leads to

H 2: Average wages in the BGE are permanently above c_0 .

Contrary to the BGE, positive reciprocity cannot play a role in the CCM because effort is exogenously fixed. Moreover, while in the BGE a worker has the option of punishing a firm by rejecting its wage offer, the opportunities for this kind of negative reciprocation are also greatly diminished in the CCM because each worker can accept a wage offer. In the CCM it is not possible for a single worker to punish a firm which made a low wage offer. Only if all workers together reject an offer can a firm be punished. Punishment requires, therefore, some implicit coordination. Even if all workers would be willing to forgo some money in order to punish a firm

[12] Our BGE resembles the simple ultimatum game which has been analysed, for example, in Güth, Schmittberger and Schwarze 1982; Forsythe, Horowitz, Savin and Sefton 1988; Ochs and Roth 1989; Güth and Tietz 1990; Bolton 1991; Roth, Prasnikar, Okuno-Fujiwara and Zamir 1991; Bolton and Zwick 1992. As in the simple ultimatum game the subgame perfect equilibrium (in case of money maximizing agents) of the BGE implies an extreme outcome: Workers always choose e = 0.1 and accept any w above 20 while firms propose w = 20. Yet, contrary to a simple ultimatum game the BGE provides opportunities for positive reciprocation. Therefore, besides preventing negative reciprocation, that is, rejection of low wage offers, the opportunities for positive reciprocation give firms an important additional reason for offering high wages.

they may be unable to establish the required implicit coordination[13]. In addition, the large excess supply of workers, which is publicly known, creates strong competitive pressures among workers. To catch an offer each worker is tempted to accept before the others.

In case that all subjects are rational money maximizers the competitive equilibrium prediction for the CCM is straightforward. The labor demand curve is initially horizontal at $v = 120$ and becomes vertical at N whereas the labor supply curve is initially horizontal at $c_0 = 20$ and becomes vertical at L. Since $L > N$, the intersection between demand and supply occurs at $w = 20$.

Early research (Smith 1964) about the effects of one-sided oral auctions has shown that if only buyers are allowed to make price quotations, the mean price per trading period tends to converge to a level which is slightly above the competitive market clearing price. The fact that mean prices are only slightly above the competitive price has been confirmed by a study of Plott and Smith (1978) for the multiple unit case. In a more recent extensive study (Walker and Williams 1988) of one- and double-sided auctions, the authors could not find significant differences in mean prices across trading institutions. Mean prices in bid- offer- and double-auctions tended to converge to the competitive equilibrium price. It seems that the results provided by Walker and Williams are now accepted as showing that oral bid markets converge to the competitive equilibrium, and that the process of convergence is not different from convergence in oral double auctions or oral offer markets (Plott 1989, p. 1126).

This evidence in favor of the competitive equilibrium prediction in one-sided oral bid markets seems to suggest that in our CCM outcomes will also converge to the competitive solution. For three reasons we are, however, more cautious here. First of all, due to the large excess supply of labor there is an extremely intense competition among workers. The participation in a trade is, under such conditions, not costless. Quite a bit of concentration and psychic competitiveness may be necessary to catch an offer. Therefore, workers may not find it worthwhile to fight for very low offers which clearly weakens the impact of competition. Secondly, in the experiments quoted above the competitive equilibrium did not imply the extreme earnings inequality as in our CCM. And thirdly, experimental subjects were not informed about other subjects' monetary payoffs in these experiments. In our CCM the combination of psychic costs of participation in a trade with extreme earning inequalities and with public information about payoffs[14] may well contribute to

[13] This problem is particularly severe, if workers differ according to their willingness to pay for punishment and if there is incomplete information about these differences.

[14] The study of Loewenstein, Thompson and Bazerman (1989) shows that subjects exhibit a strong aversion against disadvantageous inequality. In their study subjects had to rank outcomes that involved monetary payoffs for themselves and for a partner in a commercial project. Keeping a subject's payoff constant, inegalitarian outcomes

wages above $c_0 = 20$. Yet, since positive reciprocity is absent and since the opportunities for negative reciprocation are much weaker in the CCM we formulate the following hypothesis:

H 3:Average wages in the CCM, w^{CCM}, converge to significantly lower levels than average wages in the BGE, w^{BGE}. Yet, w^{CCM} does not converge towards $c_0 = 20$. Instead it stabilizes at a level significantly above 20.

Figure 2 shows the evolution of average wages over time. As we can see, w^{BGE} is always above w^{CCM}. While w^{BGE} is most of the time around 60, w^{CCM} is, from period 3 onwards always in the vicinity of 40. In period ten w^{BGE} approaches 63.5 while w^{CCM} equals 39. The clear divergence of w^{BGE} and w^{CCM} is confirmed by the t-statistics of Table 7. This Table shows the t- and prob-values for the null hypothesis that, in period t, $w_t^{BGE} = w_t^{CCM}$. From period 3 onwards this hypothesis can be rejected. In addition, Figure 2 shows that w^{CCM} does not converge to $c_0 = 20$. Instead it remains remarkably stable at a level of approximately 40. Thus H2 and H3 are supported by the data.

INSERT FIGURE 2 HERE
INSERT TABLE 7 HERE

The GEM has features of both the BGE and the CCM. On the one hand, as in the CCM, there is a considerable excess supply of workers and competitive pressures among workers do not seem to leave much opportunities for negative reciprocation. On the other hand, as in the BGE, positive reciprocation is possible. Two opposing forces are, therefore, present in the GEM: Competitive forces which tend to drive wages towards CCM-levels and positive reciprocity forces which tend to push wages towards BGE-levels. This generates the following hypotheses:

H 4: (i) Average wages in the GEM, w^{GEM}, converge to significantly lower levels than w^{BGE} and (ii) to significantly higher levels than w^{CCM}.

Since H4 sharply contradicts the competitive equilibrium predictions in case of money maximizing workers it seems worthwhile to describe these predictions in more detail. If it is common knowledge that all agents are rational money maximizers the outcome of the GEMs should not differ from the outcomes of the CCMs. This follows simply from the fact, that a money maximizing worker will choose $e = 0.1$ for any w. If workers behave in this way the GEM

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in favor of the partner were ranked very low while outcomes with advantageous inequality were ranked significantly higher. If workers in our experiment strongly dislike disadvantageous inequality, wages in the vicinity of 20 will not be accepted. This is compatible with Smith (1980, 1982) who argued that public information about payoffs slows down convergence to the competitive equilibrium.

degenerates into a CCM in which effort is exogenously determined. For $e = 0.1$, the demand and supply curve of the GEM are similar to those of the CCM[15]. If, in addition, $L > N$ demand and supply curve in the GEM intersect also at $w = 20$. Thus the competitive equilibrium predictions for w are the same in the CCM and the GEM.

Figure 2 gives us a first hint regarding the validity of H4. As we can see, w^{GEM} is always above w^{CCM}. Moreover, according to Table 7 the hypothesis that $w_t^{GEM} = w_t^{CCM}$ can be rejected from period two onwards, that is, the observed wage differences are significant. Thus, the second part of H 4 is confirmed.

Our comparison between w_t^{BGE} and w_t^{CCM} indicates that competition and the absence of positive reciprocity has a wage depressing effect. On the other hand, comparison between w_t^{GEM} and w_t^{CCM} reveals that positive reciprocity is capable of at least partially offsetting the forces of competition. There remains to be checked to what extent competitive forces are outweighed.

Comparing w_t^{BGE} with w_t^{GEM} allows us to see whether the introduction of competition has any wage depressing effect. Figure 2 again gives us a first indication. During the initial periods, particulary in period three and four, average wages are lower in the GEM. Yet, from period five onwards it is difficult to see any differences. Sometimes w_t^{GEM} is higher, in other periods w_t^{BGE} is higher. From Figure 2 one might, therefore, conclude, that the wage depressing effect of competition is only of a temporary nature while in the long run this effect vanishes. And indeed, this conclusion is confirmed by Table 7. In period three and four w_t^{BGE} is significantly higher than w_t^{GEM} ($t_3 = 2.1$, $t_4 = 2.7$). In all other periods, however, differences in average wages are not significant. Therefore, the first part of H 4 is rejected.

V. Interpretation and Discussion

According to the results presented in the previous section reciprocal behavior of workers seems to be a stable phenomenon. Although some workers reciprocate more and at higher levels than others the extent of reciprocation over time is rather stable. There do not seem to be learning effects which contribute to a decrease or an increase of reciprocation over time (see Table 5 and 6). Reciprocal effort choices violate the assumption that behavior is solely driven by rational egoistic preference maximization. And they indicate that under conditions of unspecified obligations a norm of reciprocity shapes subjects' behavior.

[15] They are identical if $L_{GEM} = L_{CCM}$ and $N_{GEM} = N_{CCM}$.

There is some indication that in the GEM wage increases generate higher effort increases than in the BGE. In view of the fact that the reference agent is less clearly defined in the GEM this result is somewhat surprising. On the other hand, in the GEM there is a nonzero probability that a worker is randomly rematched with the same firm in future periods while in the BGE this probability is zero. Due to this nonzero probability of being rematched with the same partner workers might have thought that positive reciprocation in period t would generate high wages in period $t + i$ ($i = 1,2...$). Notice, however, that due to the anonymity of trading partners, no agent could develop an individual reputation. Thus, high effort levels could only contribute to the reputation of workers as a group. But from the viewpoint of an individual worker group reputation is clearly a public good. From many public goods experiments with finitely repeated voluntary contributions we know that towards the end contributions sharply diminish [16]. Moreover, in our context the economic value of workers' group reputation declines with the number of periods; the lower the number of remaining periods the less often workers will have the opportunity to benefit from reputation-induced high wages. Therefore, if group reputation effects are responsible for the fact that β_t is higher in the GEM than in the BGE we should observe that the β_t-coefficients in the GEM converge gradually to the β_t-coefficients of the BGE. Yet, as Table 6 reveals, no such convergence can be observed. The BGE-coefficients are permanently lower than the GEM-coefficients. Therefore, the higher degrees of reciprocation in the GEM remain somewhat puzzling.

If we move from the bilateral gift exchange framework to a gift exchange framework with competitive markets and a large excess supply of labor we make the startling observation that the introduction of competition has no wage decreasing effect in the long run. Only in the short-run, that is, in the first three to four periods firms tried to push down wages a little bit. This time pattern indicates a learning effect on the firms' side. By paying lower wages they experienced also lower effort levels. As a consequence they refrained from taking advantage of the competition among workers. Although they could have enforced lower wages they did not want to enforce them because they designed their wage offers in view of the effect of wages on effort levels.

The above reasoning is of course an interpretation of firms' behavior in terms of unobservable motives. Several pieces of evidence, however, support this interpretation. In Figure 3 we show again the average wages which resulted from the acceptance of wage offers in the GEM and the CCM. The fact that accepted average wages in the CCMs are considerably lower than those in the GEMs indicates that firms in the GEMs could have enforced lower wages. In addition, Figure 3 shows the nonaccepted wage offers of firms. As we can see, in the CCMs firms never stop trying to enforce lower wages. In all CCM-periods there is a large number of nonaccepted wage offers

[16] See Ledyard (1993).

which are below accepted average wages[17]. In some periods there are more than 20 such nonaccepted offers; overall there are never less than 11 nonaccepted wage offers below accepted average wages. This pattern differs sharply from the GEMs. In the first three GEM-periods there are only 3 such nonaccepted offers per period (see Figure 3). From period five onwards there is not a single nonaccepted wage offer in the GEMs. In our view this is a strong indication that firms just did not want to enforce lower wages.

INSERT FIGURE 3 HERE

Except for the earlier periods, firms in the GEM made exactly one offer and each knew that it would be accepted immediatley. Most GEM-periods did not last longer than 45 seconds while in the CCMs the time limit of four minutes was almost always exhausted. In the CCMs workers waited till the end of the trading period before they accepted the best offers. In this way they tried to prevent wages from falling to even lower levels. In contrast, in the GEMs wage offers were immediately accepted because they were relatively high. A final piece of evidence in favor of our interpretation comes from the answers to a questionnaire. At the end of a session subjects were asked several questions. The questionnaire allowed them to express their degree of agreement with different statements on a five-stage scale [from "I completely disagree" (1) to "I completely agree" (5)]. One statement in the firms' questionnaire was as follows: "When I offered a high wage I hoped that workers would choose a high effort level". Most employers completely agreed with this statement.

In a recent contribution Fehr, Kirchsteiger and Riedl (FKR, 1993) have shown that in GEMs reciprocal effort choices emerge and give rise to seemingly noncompetitive wages. The FKR-design consisted only of four twelve-period GEM-sessions[18]. With the GEM alone it is, however, impossible to determine the relative strength of social forces vis a vis competitive forces.

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[17] The large number of relatively low wage offers in the CCMs is also an indication that there is no experimenter effect. The presence of an experimenter, who knows what subjects are doing, did not prevent firms from making "greedy" wage offers. Figure 3 does not show all nonaccepted wage offers in the CCMs because it occurred frequently that the same (nonaccepted) wages were offered in different CCMs. Figure 3 shows, however, all nonaccepted wage offers in the GEMs.

[18] Our GEMs differ somewhat from the GEMs in FKR (1993). Our experiments were framed in labor market terms while FKR used good market terms. This increases the external validity of our results with respect to labor markets. There are also small parameter differences. More importantly, we used mainly nonstudent participants (soldiers) and average incomes per session were rather high (more than one week's income). FKR used students and much lower monetary incentives. Finally, in FKR wage offers had to be multiples of five while in our experiments any integer between 20 and 120 could be chosen. It may be that the improvement rule in combination with the restriction on wage offers had a wage increasing effect in the FKR-design.

Moreover, it is even possible to argue that GEM-wages do not constitute wages above the competitive level. The possibility for such an argument follows from the fact that subjects know the payoffs of their trading partners. In case that both their own monetary payoff and the monetary payoff of their trading partner enters their utility function the experimenter loses control over subjects' preferences and, in particular, over workers' reservation wages. Without knowledge of subjects' preferences (workers' reservation wages) it is no longer possible to precisely determine the competitive equilibrium wage. If, for example, workers have a strong aversion against disadvantageous inequality they prefer to reject low wages, that is, their reservation wages are strictly above $c_0 = 20$.

That with full information about payoffs interdependent preferences are the rule rather than the exception has been shown by Loewenstein, Thompson and Bazerman (1989)[19]. Their results indicate that subjects strongly devalue outcomes which give them less than their trading partner. Furthermore, the fact that workers in our BGE- and GEM-experiments behave reciprocally may also be taken as an indication of interdependent preferences. In the face of this loss of control over subjects' preferences it is necessary to introduce further controls. This was the reason for the introduction of the BGEs and CCMs. The CCM-outcomes provide us with upper bounds on workers' reservation wages. If we observe that average wages in CCMs converge towards 39 Guilders while average wages in GEMs converge towards 63 Guilders we can indeed conclude that GEM-wages are noncompetitive because workers' reservation wages are not higher than 39 Guilders on average. This allows us to say that social forces are capable of outweighing competitive forces at least partially. On the other hand, by comparing BGE-wages with GEM-wages we are able to determine to what extent competition inhibits the impact of social forces. In the absence of such a comparison of GEM-outcomes with CCM- and BGE-outcomes, no unambiguous conclusions regarding the relative strength of these forces and the existence of noncompetitive wages can be drawn.

In our BGEs and GEMs the labor contract does not stipulate the effort level. They can, therefore, be viewed as a form of principal-agent experiment or quality uncertainty experiment. During the last decade a number of principal-agent experiments (e. g. DeJong, Forsythe, Lundholm (DFL) 1985) and experiments in which buyers do not know in advance the quality of the goods bought have been conducted (Plott and Wilde (PW) 1982, Miller and Plott (MP) 1985, Lynch, Miller Plott and Porter (LMPP) 1986 and 1991, Holt and Sherman (HS) 1990). Yet, to our knowledge, there are no studies which address the question to what extent the norm of reciprocity affects the market outcome. In the LMPP papers and the MP paper, for example, the authors implemented

[19] See our previous remarks in footnote 13.

the double auction institution which lacks the reciprocal structure of our BGEs and GEMs[20]. In the HS experiments the authors implemented a posted offer market in which sellers chose both price and quality. This design also lacks the reciprocal nature of our experiments and seems more suitable of capturing essential characteristics of markets for consumer goods and services. A similar remark applies to DFL (1985) in which sellers also chose both price and quality[21].

VI. Final Remarks

The regularities of the data presented in this paper show that under conditions of unspecified obligations reciprocal behavior is a stable phenomenon. Moreover, if we replace, under such conditions, a bilateral bargaining environment by a competitive market with excess supply of labor, we observe no long run effect on wages. Although excess supply of labor creates enormous competition among workers, firms do not take advantage of this fact. It seems that, instead of being governed by competitive forces, firms' wage offers are solely governed by reciprocity considerations in the long run.

At this point it seems worthwhile to stress that the above results occur under conditions of complete anonymity between trading partners and despite the one-shot nature of the trades. It was impossible for subjects to reward or punish an agent's past behavior. Nor was it possible for a subject to develop a reputation. According to social exchange theory the extent to which the norm of reciprocity governs individual behavior is greatly increased when interactions occur (i) face to face and/or (ii) repeatedly. In the presence of repeated interactions it is of course much easier to develop trust. And in face to face interactions considerations of social approval are likely to give rise to a strengthening of reciprocal ties. The employment relationship typically involves repeated interactions on a face to face basis (with superiors and colleagues). Is it then not reasonable to expect that in the presence of repeated face to face interactions social forces have a permanent nonnegligible impact on wage formation?

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[20] LMPP were mainly concerned with the important question whether the market can enforce the efficient quality level and, if not, under which regulatory conditions the highest level of quality efficiency can be achieved.

[21] In MP (1985) sellers chose the price of the good whereas the type ("quality") of the good they could sell in any given period was determined exogenously by the experimenter (Regulars or Supers). Buyers did not know in advance whether the seller with which they happened to trade could sell a Regular or a Super. The fact that Regulars and Supers were exogenously assigned to the sellers is a further reason for the absence of a reciprocal structure.

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Table 1

e	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
c(e)	0	1	2	4	6	8	10	12	15	18

Table 2

(EXPERIMENTAL DESIGN)

	Bilateral Gift Exchange **(BGE)**	Gift Exchange Market **(GEM)**	Complete Contracts Market **(CCM)**
Parameters	$v = 120,\ c_o = 20$	$v = 120,\ c_o = 20$	$v = 120,\ c_o = 20$
feasible effort levels	$e \in (0.1, 1)$	$e \in (0.1, 1)$	$e = 1$
feasible wages	$v \geq w \geq c_o$	$v \geq w \geq c_o$	$v \geq w \geq c_o$
wage determination	firms commit themselves to a wage level	one-sided oral auction; firms are wage setters	one-sided oral auction; firms are wage setters
matching process	exogenous	via acceptance of wage offers	via acceptance of wage offers
# firms (N) # workers (L)	N = L	6-8 firms; exogenous excess supply of labor of <u>at least</u> 50%	6-8 firms; exogenous excess supply of labor of <u>exactly</u> 50%
Information conditions	v, c(e), c_o, N, L were common knowledge; identity of trading partner unknown	v, c(e), c_o, N, L were common knowledge; identity of trading partner unknown	v, c_o, N, L were common knowledge; identity of trading partner unknown
Predictions with rational money maximizers	convergence towards w = 20 e = 0.1	convergence towards w = 20 e = 0.1	convergence towards w = 20

Table 3

RESULTS OF TOBIT-REGRESSION (3):

$e = \alpha + \beta w + \varepsilon$ if $0.1 < RHS < 1$

and $e = 0.1$ ($e = 1$) if $RHS \leq 0.1$ ($RHS \geq 1$)

where $RHS \equiv \alpha + \beta w + \varepsilon$

	N	α	$p(\alpha)$	β	$p(\beta)$
BGE	365	0.019	0.699	0.0057	0.000
GEM	260	- 0.129	0.034	0.0088	0.000

BGE: Bilateral Gift Exchange
GEM: Gift Exchange Market
N: Number of observations
$p(\alpha)$: prob-value for H_0 that $\alpha = 0$
$p(\beta)$: prob value for H_0 that $\beta = 0$

Table 4

RESULTS OF TOBIT-REGRESSION (4):

$$e = \sum_{i=1}^{n} \gamma_i d_i + \beta w + \varepsilon \qquad \text{if } 0.1 < RHS < 1$$

and $e = 0.1$ ($e = 1$) if $RHS \leq 0.1$ ($RHS \geq 1$)

$$\text{where } RHS \equiv \sum_{i=1}^{n} \gamma_i d_i + \beta w + \varepsilon$$

and $d_i = 1$ in case that worker i chose effort

	N	β	p(β)	W-st	p(W)
BGE	365	0.0057	0.000	39.8	0.005
GEM	260	0.0095	0.000	157	0.000

BGE: Bilateral Gift Exchange
GEM: Gift Exchange Market
N: Number of observations
n: number of workers
p(β): prob value for H_0 that $\beta = 0$
W-st: CHI (n-1) distributed Wald statistic for H_0 that all γ_i are equal to the α-coefficient in Table 3
p (W): prob-values of Wald-statistic

Table 5

RESULTS OF TOBIT-REGRESSION (5):

$$e = \sum_{t=1}^{10} \delta_t d_t + \beta w + \varepsilon \quad \text{if } 0.1 < RHS < 1$$

and $e = 0.1$ ($e = 1$) if $RHS \leq 0.1$ ($RHS \geq 1$)

where $RHS \equiv \sum_{t=1}^{10} \delta_t d_t + \beta w + \varepsilon$

and $d_t = 1$ ($d_t = 0$) in case of period t observations (otherwise)

	N	β	p(β)	W-st	p(W)
BGE	365	0.0056	0.000	6.8	0.745
GEM	260	0.0091	0.000	3.4	0.971

BGE: Bilateral Gift Exchange
GEM Gift Exchange Market
N: Number of observations
p(β): prob value for H_0 that $\beta = 0$
W-st: CHI (9) distributed Wald statistic for H_0 that all γ_t are equal to the α-coefficient in Table 3
p(W): prob-values of Wald statistic

Table 6

RESULTS OF TOBIT-REGRESSION (6):

$$e = \alpha + \sum_{t=1}^{10} \beta_t d_t w + \varepsilon \quad \text{if } 0.1 < \text{RHS} < 1$$

and $e = 0.1$ ($e = 1$) if $\text{RHS} \leq 0.1$ ($\text{RHS} \geq 1$)

where $\text{RHS} \equiv \alpha + \sum_{t=1}^{10} \beta_t d_t w + \varepsilon$

and $d_t = 1$ ($d_t = 0$) in case of period t observations (otherwise)

prob-values of all β_t-coefficients are smaller than 0.0001

	BGE	GEM
N	365	260
α $p(\alpha)$	0.025 (0.607)	-0.148 (0.021)
β_1	0.0064	0.0096
β_2	0.0051	0.0095
β_3	0.0058	0.0093
β_4	0.0065	0.0088
β_5	0.0060	0.0095
β_6	0.0047	0.0096
β_7	0.0059	0.0092
β_8	0.0056	0.0088
β_9	0.0049	0.0086
β_{10}	0.0059	0.0086
W-st	8.44	3.68
p (W)	0.586	0.961

BGE: Bilateral Gift Exchange
GEM: Gift Exchange Market
N: Number of observations p(W): prob-values of Wald statistic
W-st: CHI (9) distributed Wald statistic for H_0 that all β_t-coefficients are equal to the β-coefficient in Table 3

Table 7

t-statistics and prob-values for H_0 that in a given period average wages are the same across treatments

period	H_0: $w_t^{BGE} = w_t^{GEM}$		H_0: $w_t^{BGE} = w_t^{CCM}$		H_0: $w_t^{GEM} = w_t^{CCM}$	
	t-statistic	prob-value	t-statistic	prob-value	t-statistic	prob-value
1	0.3	0.751	3.4	0.001	5.1	0.000
2	0.2	0.813	1.9	0.051	2.3	0.023
3	2.1	0.044	4.7	0.000	5.1	0.000
4	2.7	0.008	6.7	0.000	3.6	0.000
5	0.4	0.668	6.9	0.000	6.4	0.000
6	0.7	0.489	5.5	0.000	8.8	0.000
7	0.1	0.911	6.9	0.000	10.1	0.000
8	0.2	0.817	6.9	0.000	12.5	0.000
9	- 1.1	0.281	7.4	0.000	11.6	0.000
10	0.2	0.881	6.5	0.000	10.1	0.000
8-10	- 0.4	0.716	12.1	0.000	19.5	0.000

w_t^j: average wage in period t and treatment j; j = BGE, CCM, GEM

DF: degrees of freedom

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